

*Oil Well Records, selected from the collections of Mr. J. F. Carll, Assistant Geologist in charge of the Geological Survey of the Oil District of Pennsylvania. Communicated by J. P. Lesley, State Geologist.*

(*American Philosophical Society, Dec. 15, 1876.*)

I hope to present at another meeting my views of the value of these records, and an analysis of the conclusions arrived at by Mr. Carll from a comprehensive study of many hundreds of such records collected by him during the last three years, since the commencement of the Second Geological Survey of the State in 1874; as well as from his practical experience of operations in the Oil Region since 1865.

The scientific value of well records is indeed limited by many conditions, each of which should be separately considered. But there can be no question of the utility of preserving them from destruction by publishing them in the printed archives of a society like this. Their publication will answer many questions put by men of science abroad and at home; will place at the service of investigators the original data of our own calculations; will invite the intelligence of thoughtful men in the Oil Region to a more careful scrutiny of such data; and above all, will induce many well borers to be more precise and complete in making up future records, and perhaps to communicate them for comparison. In this way only will it be possible to arrive at broad and true answers to moot questions which no one has yet succeeded in satisfactorily answering, except in a very local and unconnected manner.

Technical names and terms ought to be explained to those who have no business at the wells, but such a glossary would be a long one.

The height of each well mouth above the fixed ocean level datum of the Coast Survey should always be given; but it is often wanting, and then the value of the well record becomes comparatively low.

The well records of one locality have been grouped together; but it must be understood that not one in ten has been obtained, and the whole list is therefore but a meagre selection.

The first groups have been obtained from Companies operating in Warren and Venango Counties; others might have been added from Clarion and Butler Counties as specimens of the collections made in those Counties, to be published hereafter to show the geological persistency of the Oil-Sand Group from Tidioute to Butler.

*Colorado Well, No. 1.*

August 12th, 1870.

. Located in Warren County, Southwest Township, Pa. on Pine Creek, or East Oil Creek, between Pleasantville and Tidioute, and two miles north-east of Enterprise.

Level of well mouth above ocean level in feet.*.....	1367
Casing to rock.....	36 to 36 = 1331

\* On the provisional assumption that Oil City Depot is 995' above *mean high tide P. R. R. datum*; and 7' added for ocean level in Raritan Bay.

Interval of measures unnamed.....	236	to	270	=	1097
First Sand (1st S. S.).....	57	"	327	=	1040
Interval unnamed.....	88	"	415	=	952
Second Sand (2d S. S.).....	24	"	439	=	928
Interval unnamed.....	81	"	520	=	847
Third Sand (3d S. S.).....	46	"	566	=	801
Well carried down in "Pocket".....	9	"	575	=	792

Size of hole  $5\frac{1}{2}$ " ; drilled wet ; cased with  $3\frac{1}{4}$ " casing to shut off the water. Seed bag on casing below 2d S. S. say at about 445'.

A "mud vein" 8' below top of 3d S. S. at 528'.

The oil sand was of uniform color [white and pebbly] with the softest stratum on top, and appearances indicate that nearly if not quite all the oil comes in the well at 5 or 6 feet below the top of the 3d sand, between which points both torpedoes were exploded.

This well was pumped about thirty days, part of the time with a gas pump attached and part of the time without one.\* The largest natural production without the gas pump was 4 barrels per day. The first day after the gas pump was applied the production increased to 6 barrels, from which point it gradually declined to less than 4 barrels.

On the 21st of November, 1870, it was torpedoed at a point  $5\frac{1}{2}$  feet below the top of the 3d S. S. It then produced 160 barrels per day for the first few days, but gradually declined to 13 barrels per day by the 1st of June, in the following year, 1871. The gas pump was again tried with no satisfactory results, and taken off as worthless or of no benefit to the well.

On December 21st, 1871, the production had declined to 10 barrels. A one quart nitro-glycerine torpedo was then exploded in the oil sand, which increased the production to 40 barrels per day. But this continued only a day or two. It immediately commenced decreasing, and on the 1st of August, 1872, about two years from the time it was first pumped, it had declined to its first natural production of 4 barrels per day.

During this month, August, 1872, the "volcanic treatment" was tried upon the well at three different times. The first time 4 burners were used, resulting in a slight increase of gas, but no increase of oil.†

The second time 7 burners were used, same results.

\* Every oil well has more or less gas, which, separating from the oil at the bottom of the well rises between the tubing and casing and escapes through a pipe provided for the purpose, at the well mouth. A "gas pump" is an instrument which is attached to this escape pipe to relieve the rising gas from atmospheric pressure and thus facilitate and increase its flow. In many cases it not only augments the flow of gas but very materially improves the oil production of the well. A "Rotary" or "Gas Blower" is sometimes used for the same purpose.

† The "volcanic burner" is a patented article designed to increase the production of a well by intensely heating the fluid at the bottom. It consists of a case filled with chemical ingredients. After lowering it to the desired spot the materials are ignited by an electric spark. The operation is repeated until the desired heat has been obtained, when the tubing is at once put in and pumping resumed.

The third time 9 burners were used, same results, leaving the well at the end of the treatment with an appreciable increase of gas, but no improvement in the supply of oil.

A "scratcher" was also used in this well once, but with no benefit.\*

By a series of experiments in casing and pumping, the salt water is supposed to come into the well with the oil near the top of the 3d S. S.

*Colorado Well, No. 2.*

Located on Colorado Oil Tract, 15 rods south of No. 1, and at the same altitude.

Dry cased hole. Salt water in second sand. Cased below second sand. Produced no oil and only about a quarter of a barrel of salt water per day.

Sand rocks about the same thickness as in well No. 1, but the third sand was of inferior quality, very little of it being white.

*Colorado Well, No. 3.*

August 20th, 1870.

Located 13 rods, N. 78° E., from No. 1.

Level of well mouth above ocean level in feet†.....	1404
Casing to rock.....	34 to 34 = 1370
? .....	279 " 313 = 1091
1st S. S. ....	44 " 357 = 1047
? .....	97 " 454 = 950
2d S. S. ....	21 " 475 = 929
? .....	84 " 559 = 845
3d S. S. ....	45 " 604 = 800
? .....pocket.	8 " 612 = 792

Mud vein in 3d S. S. at 566 feet.

Cased at 475 feet.

3d S. S. { top 6' gray, with but little white.  
 next 2' white and soft (good).  
 next 20' white, but close.  
 bottom 17' mixed gray and white.

When first pumped it yielded only one barrel of oil per day and continued thus until a "scratcher" was used, which brought the production up to 15 barrels for a few days. It then declined to 4 barrels when a three pint nitro-glycerine torpedo was inserted 6 feet from the top of the third S. S. After this it produced 100 barrels per day for a short time.

\* A "scratcher" is a round brush, about three feet long, made of steel wire. When it is to be used the tubing is drawn from the well, a few barrels of benzine are poured in and the scratcher is attached to the sucker rods and run down to the oil rock, where it is worked up and down for some time to scratch or scrub the walls of the well and assist the benzine in the dislodgment of whatever may have accumulated there.

† Oil City Depot provisionally 995 + P. R. R. datum.

The use of benzine in this well gave no satisfactory results, probably on account of salt water.

Three pint torpedo exploded 8 feet below top of 3d sand, May 30th, 1872. Daily production increased to 10 barrels, but declined to 5 barrels in 10 days. Torpedoed again, Dec. 18th, 1872. Result not stated.

*Colorado Well, No. 4.*

August 20th, 1872 (?).

Located 5½ rods S. E. of McKinney's N. E. corner.

Level of well mouth 26' lower than No. 1*.....				1341
Drive pipe to rock.....	31	to	31	= 1310
? .....	205	“	236	= 1105
1st S. S.....	45	“	281	= 1060
? .....	109	“	390	= 951
2d S. S.....	21	“	411	= 930
? .....	84	“	495	= 846
3d S. S.....	43	“	538	= 803
? .....	6	“	544	= 797
				pocket.

Drilled dry. Cased at 412 feet.

Best natural production, 2 barrels per day.

The hole was dry when the 3d sand was struck, and remained so until the drill had penetrated the 3d sand 5½ feet. At this point oil and salt water came in. The best part of the sand was from 505 feet to 515 feet ; below this the sand was poor.

The first torpedo was exploded 5 feet below top of rock.

“ second “ “	10	“	“	“
“ third “ “	5	“	“	“
“ fourth “ “	15	“	“	“ May 4th, 1872.

The production was increased by the first torpedo but soon settled back to about 5 barrels per day. The same effect followed the second and third. The fourth was a one quart nitro-glycerine blast, but it made very little increase in the oil flow. Benzining, flooding the sandrock with oil, and “scratching” the walls, all failed to produce beneficial results.†

\* Oil City Depot provisionally 995' + P. R. R. datum.

† A well is “flooded” by pouring sufficient fluid in at the top, while the pump remains idle, to fill up the shaft several hundred feet, more or less, above the oil sand. Benzine and crude oil are both used for this purpose; the object being to saturate the rock, under pressure, in order that the paraffin or other accumulations which may have adhered to its surface or obstructed its pores may be loosened and removed with the fluid when the pump is again started.

*Colorado Well, No. 5.*

Struck about August, 1871.

Located 14 rods south of No. 4.

Level of well mouth above ocean level, No. 1 + 31' =*	.....	1398
Drive pipe to rock.....	70 to 70 =	1328
1st and 2d Sands and intervening measures		
"regular" to top of 3d S. S.....	423 " 493 =	905
3d S. S.....	43 " 536 =	862
? .....pocket.	7 " 543 =	855

Wet hole. Cased at 217 feet. Crevice in 3d sand 11 feet below the top.

Natural production 60 barrels per day at commencement, but declined quite rapidly to 15 barrels. Remained thus for some time until torpedoed when it declined to 10 barrels.

First torpedo exploded 5 feet below top of 3d S. S.

Second " " 11 " " "

Third " " 5 " " "

Fourth " " 26 " " "

The production steadily declined; no beneficial results following the use of any of the torpedoes, except a slight temporary increase from the last.

The volcanic treatment was also tried without any marked effect.

The 3d sand was better than the average sands of other wells drilled in this neighborhood. The best and softest stratum commenced 3 feet below the top of the rock and continued to 7 feet. From 11 feet downward to the bottom of the rock the sand was good, but not as soft as in the upper division.

*Colorado Well No. 6.*

August 16th, 1871.

Level of well mouth above ocean*.....	.....	
Casing to rock.....	32 feet. 32 =	
?.....	318 to 350 =	
1st S. S.....	40 " 390 =	
?.....	107 " 497 =	
2d S. S.....	19 " 516 =	
?.....	81 " 597 =	
3d S. S.....	46 " 643 =	
? .....pocket.	8 " 651 =	

Wet hole, cased at 516.

Third sand very close and hard. Natural production less than 1 barrel per day.

First torpedo exploded 7 feet below top of 3d S. S. Production increased to 10 barrels but soon declined to 5 barrels.

Second torpedo 6 feet lower. Increase to 10 barrels but for shorter time than the first.

Scratched, with no benefit.

\* Oil City Depot provisionally 995' + P. R. R. datum + 7 for ocean level.

Third torpedo, May 8th, 1872, 7 feet lower than the second. Slight increase in oil.

Fourth torpedo, July 13th, 1872. 5 feet below top of 3d S. S., and 2 feet above the point at which the first was exploded. Increased production but did not pay for cost of torpedoing.

Abandoned August 2, 1872.

*Colorado Well No. 7.*

Struck August 8th, 1871.

Level of well mouth above ocean.....			
Drive pipe to rock.....	75 feet.	75	=
?.....	190 to	265	=
1st S. S.....	25	" 290	=
?.....	79	" 369	=
2d S. S.....	15	" 384	=
?.....	96	" 470	=
3d S. S.....	43	" 513	=
?.....pocket.	8	" 521	=

Wet hole. Cased at 386.

Mud vein 12 feet below top of 3d S. S. Natural production 7 barrels per day for a few days.

Third sand poor. From marks of oil on the tubing while the well was being pumped, it was inferred that the oil came in at a point in the sand-rock just under the "mud vein," say from 12 to 15 feet below the top of the sand.

A three pint nitro-glycerine torpedo was discharged at the point in the sandrock where the oil appeared to come in. The production rose at once to 40 barrels per day, but declined rapidly to 20 barrels and then slowly to 17 barrels, at which figures it remained for more than three months, when it was flooded with water from well No. 10, then drilling within 15 rods of No. 7. When No. 10 was completed and tubed, and the water in it partially exhausted, this well, No. 7, began to recover its oil, but not in so large quantities as before it was flooded. From the time No. 10 began to pump oil, in January 1872, until July of the same year, No. 7 slowly declined in production and at the latter date was pumping only 2 barrels per day.

It was then torpedoed again at the same point as at first, after which it yielded, for a short time, 25 barrels per day and then declined rapidly to 4 barrels.

During the great "shut down movement of October, 1872," when all the walking-beams in the Oil Regions were stopt for 30 days, this well lay idle. But on starting up again in November, it produced 40 barrels per day for three days. Seven days later it was producing 8 barrels, and at the end of one month had settled to its old production before the "shut down," say 4 barrels.

*Colorado Well No. 8.*  
Struck November, 1871.

Level of well mouth above ocean.....			
Casing to rock.....	10 feet.	10	=
?.....	268 to	278	=
1st S. S.....	30	" 308	=
?.....	102	" 410	=
2d S. S.....	20	" 430	=
?.....	85	" 515	=
3d S. S.....	46	" 561	=
?.....pocket.	4	" 565	=

Drilled dry. The casing was first put in at 180 feet. Failing to shut off the fresh water, it was drawn and the large hole continued down to 278 feet. At this point it was cased again, but both fresh water and salt water came in below as the drill went down, and the casing had to be drawn the second time. The well was then reamed down to the second sand, and 432 feet of casing put in, after which the hole remained perfectly dry until the oil sand was reached.

The upper 20 feet of the 3d S. S. was good. The lower (26 feet) was finer, of a grayish color and intermixed with white pebbles. When the 3d S. S. was struck, gas came in very freely and the hole quickly filled up many feet with oil and salt water.

Natural production 1½ barrels per day.

Torpedoed November 21, 1871 with 2 quarts of nitro-glycerine. Exploded 6 feet below top of 3d S. S. Result, 7 barrels per day. Declined rapidly.

Torpedoed December 15, 1871 with 3 pints of nitro-glycerine. Exploded at top of 3d. S. S. Result, not satisfactory.

Torpedoed May 2, 1872 with 1 quart nitro-glycerine. Exploded 15 feet below top of 3d S. S. Result, slight improvement.

Abandoned November 7, 1872.

*Colorado Well, No. 9.*  
November, 1871.

Level of well mouth above ocean*.....				1508
Conductor to rock.....	18 feet.	18	=	1490
?.....	395 to	413	=	1095
1st S. S.....	28	" 441	=	1067
?.....	119	" 560	=	948
2d S. S.....	25	" 585	=	923
?.....	77	" 662	=	846
3d S. S.....	48	" 710	=	798
?.....pocket.	6	" 716	=	792

Drilled dry. Cased at 417½ feet.

Sand generally good.

Natural production about 3 barrels for a short time.

\* Oil City Depot provisionally 995' + P. R. R. datum.

Nov. 29th, 1871. A two quart torpedo was used 11 feet below top of 3d S. S. Result, 10 barrels per day at first, with rapid decline.

Dec. 11th. A two quart torpedo was exploded at 6 feet in the sand. Result not as satisfactory as from the first one. On May 21, 1872, the production had decreased to less than 2 barrels per day. A 3 pint torpedo was then put in 17 feet below the top of the sand. Production for the next four months, 4 barrels per day. After the "30 days shut down" of Oct. 1872, it started to pump at less than 1 barrel per day, and with very little gas. This decline was attributed to the pumping of the wells on the adjoining tract after this one had been stopt.

Nov. 26th, 1872, it was treated with 6 volcanic burners, but with very slight improvement.

Dec. 7th, 1872, exploded a 3 pint torpedo 20 feet below the top of sand. Increase in oil very slight.

June 24th, 1873. Production, half barrel per day.

*Colorado Well, No. 10.*

January 10th, 1872.

Level of well mouth above ocean.....			
Drive pipe.....	42 feet.	42	=
? .....	198 to	240	=
1st S. S.....	40 "	280	=
? .....	89 "	369	=
2d S. S.....	14 "	383	=
? .....	87 "	470	=
3d S. S.....	43 "	513	=
? .....	9 "	522	=
			pocket.

Wet hole. Cased at 274 feet, 3¼ inch casing.

3d sand of ordinary quality.

Best part of it between 482 feet and 485 feet. This well when first pumped threw off a large quantity of fresh water, and then gradually changed to salt water. The first eight days of pumping the yield of oil did not exceed 3 barrels per day. On the tenth day it produced about 100 barrels of oil, and an equal quantity of salt water. It continued to do the same with but very little variation for four months, after which it slowly declined to 60 barrels of oil, and 60 barrels of salt water. It then declined rapidly to 28 barrels of oil and very little salt water. On the 27th of November, 1872, when the oil flow had declined to 23 barrels, the well was treated with 8 volcanic burners which increased the oil to 30 barrels per day, and also augmented the volume of water. After this, until about June 1st, 1873, the production of oil fluctuated from 22 barrels to 36 barrels per day. It then suddenly declined to 12 barrels per day, with a very perceptible increase of salt water.



*Colorado Well, No. 11.*

January 20th, 1872.

Level of well mouth above ocean*.....			
Wooden conductor to rock.....	17 feet.	17	=
? .....	380 to	397	=
1st S. S.....	30	" 427	=
? .....	117	" 544	=
2d S. S.....	25	" 569	=
? .....	76	" 645	=
3d S. S.....	46	" 691	=
? .....	8½	" 699½	=

Drilled dry. Cased at 392½ feet.

3d sand good in every part, particularly so between 662 feet and 670 feet.

Natural production 190 barrels daily for five days. Decreased rapidly to 130 barrels, and then more gradually until Sept. 11th, 1872, when it was pumping only 8 barrels. At this time a 3 pint torpedo was put in, 18 feet below the top of the 3d S. S., resulting in a daily production of 150 barrels for three days. It declined rapidly. On Sept. 21st, it had fallen to 24 barrels per day, and on Jan. 1st, 1873, to 4 barrels per day. A 3 pint torpedo was then used 12 feet in the sand, and the yield was thus brought up to 15 barrels per day for a short time.

Then commenced another rapid decline carrying the production down to 3 barrels per day by the 6th of May following, when another torpedo was inserted, resulting in a slight increase of oil.

On June 24th, 1873, while pumping 4 barrels per day, an attempt was made to fill up the well by putting oil and water in at the top. After 275 pails full had been poured in, it was ascertained that it had only filled up the bottom of the 5½ inch well hole 25 feet.

*Colorado Well, No. 12.*

March, 1872.

Level of well mouth above ocean*.....				1325
Drive pipe to rock.....	57 feet.	57	=	1268
? .....	198 to	255	=	1070
1st S. S.....	40	" 295	=	1030
? .....	90	" 385	=	940
2d S. S.....	12	" 397	=	928
? .....	87	" 484	=	841
3d S. S.....	48	" 532	=	793
? .....	13	" 545	=	780

Drilled dry. Cased at 220 feet.

\* Oil City Depot provisionally 995' + P. R. R. datum.

Best part of oil sand from 492 feet to 504 feet. Oil came in while running the second "bit" after the 3d sand was struck.\*

Natural production 80 barrels per day, when first struck, declining slowly to 7 barrels by the 20th of August, 1872, when a 3 pint torpedo was put in 10 feet below the top of 3d sand. The result was an increase to 60 barrels the first 24 hours and a rapid decline to 10 barrels in 30 days. For two or three months after this it pumped steadily 10 barrels per day, and then began to decline. On May 24th, 1873, it was yielding only 3 barrels per day. Another torpedo was now exploded at a point 14½ feet below the top of the 3d S. S., bringing the production up to 30 barrels per day for two days, followed by a gradual decline to 10 barrels at the end of 30 days.

*Colorado Well, No. 13.*

July 20th, 1872.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	15 feet.	15	=
? .....	374 to	389	=
1st S. S.....	29	" 418	=
? .....	73	" 491	=
2d S. S.....	19	" 510	=
? .....	98	" 608	=
3d S. S.....	38	" 646	=
Sand and slate alternating.....	8	" 654	=
Slate.....	4	" 658	=

Drilled dry. Cased at 205 feet.

Best sand from 3 to 8 feet below the top of 3d S. S. While drilling in this the well filled up rapidly.

Natural production 3 barrels per day. July 26th, exploded a 3 pint torpedo 5 feet below top of 3d S. S., causing but little improvement in production.

Aug. 2d, 1872, exploded another 3 pint torpedo one foot higher in the sand. Increase slight. Five days after torpedoing the well was producing 5 barrels.

*Colorado Well, No. 14.*

August 1st, 1872.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	15 feet.	15	=
? .....	372 to	387	=
1st S. S.....	23	" 410	=
? .....	106	" 516	=

\* A "bit" is the technical term applied to the chisel-shape tool used in drilling before the "reamer" or finishing tool is introduced. It is seldom "run" more than three feet without being withdrawn for sharpening. Oil struck "while running the second bit" means, therefore, that it was from three to five feet below the top of the sand rock.

2d S. S.....	21 to 537 =
? .....	85 " 622 =
3d S. S.....	45 " 667 =
? .....	8 " 675 =

Drilled dry. Cased at 275 feet.

Salt water and gas appeared in 2d S. S. Third sand white and soft. Oil and salt water came in at a point 12 feet below its top. The best quality of sand was between 17 and 25 feet. Soft sand from 28 to 30 feet. Indications of a crevice between 38 and 40 feet.

Natural production 2 barrels per day.

Aug. 10th, 1872. Torpedoed (3 pints) at 18 feet below top of sand. Production rose to 14 barrels per day, but declined in 10 days to 8 barrels. Then sank to 6 barrels. Pumped steadily 6 barrels per day for a long time, then slowly began to decline, and on the 26th of June, 1873, it was pumping less than one barrel per day.

*Colorado Well. No. 15.*

August 25th, 1872.

Level of well mouth above ocean.....	
Wooden conductor to rock.....	14 feet. 14 =
? .....	306 to 320 =
1st S. S.....	27 " 347 =
? .....	83 " 430 =
2d S. S.....	20 " 450 =
? .....	97 " 547 =
3d S. S.....	38½ " 585½ =
? .....	13½ " 599 =

Drilled dry. Cased at 173 feet.

Considerable gas in 2d S. S.

Softest part of 3d S. S. commenced at 3½ feet below its top, and continued down to 7 feet. At this point there was a large amount of gas and the well filled rapidly with fluid, the larger portion of it being salt water. From 14 to 18 feet below the top of the sand, the composition of the rock was such as to warrant the expectation of a good well, but there was so much fluid in the hole at this time that it could not be positively ascertained whether oil came in at this point or not.

Natural production 1½ barrels per day.

Aug. 29th, 1872. Torpedoed (3 pints) at 5 feet below top of 3d sand. Production first 24 hours thereafter, 12 barrels; and ten days later, 10 barrels per day.

Nov. 18th, 1872. Exploded a torpedo shell filled with giant powder, said to equal in strength a 3 pint nitro-glycerine torpedo. Before torpedoing the well was pumping 5 barrels per day. Four days afterwards, it was producing 6 barrels per day. The explosion filled up the well hole 10 feet. [Meaning, no doubt, with the crushed and broken fragments of the sand rock.]

This well declined very slowly, and on June 24th, 1873, was pumping 1½ barrels per day.

*Colorado Well No. 16.*

November 6th, 1872.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	14 feet.	14	=
?.....	406 to	420	=
1st S. S.....	20	" 440	=
?.....	91	" 531	=
2d S. S.....	19	" 550	=
?.....	107	" 657	=
3d S. S.....	36	" 693	=
?.....pocket.	14	" 707	=

Drilled dry. Cased at 257½ feet.

Very small quantity of gas and salt water in 2d S. S.

Small quantity of salt water came in at the top of 3d S. S. Oil came in from 7 to 10 feet below the top. Sand good down to 14 feet. Good again from 20 to 23 feet. Below 23 feet it was fine and hard, but white, until near the bottom.

Natural production about 4 barrels of oil and 7 barrels of salt water per day.

Nov. 14th, torpedoed (3 pints) 9 feet below top of 3d S. S., it then produced 7 barrels of oil per day for about 10 days.

May 17th, 1873, pumping 1½ barrels per day. Torpedoed 20 feet below top of sand. Increased to 3 barrels per day for a short time.

June 24th, 1873, pumping 1½ barrels per day and continued to do so until Oct. 17th, 1873. Flooded with 7 barrels of Benzine, but slight increase either in gas or oil.

Nov. 16th, 1863, pumping 2 barrels per day.

*Colorado Well No. 17.*

November 23d, 1872.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	13 feet.	13	=
?.....	396 to	409	=
4st S. S.....	21	" 430	=
?.....	101	" 531	=
2d S. S.....	19	" 550	=
?.....	89	" 639	=
3d S. S.....(not through S. S.)	40	" 679	=

Drilled dry. Cased at 237 feet.

Oil came in in small quantities while running the first "bit" in the 3d S. S. First show of salt water about 14 feet below top of sand. Sand soft and white down to 27 feet, then began to change to grey. From 31 feet to 40 feet it was very poor.

Natural production  $1\frac{1}{2}$  barrels per day. Torpedoed Dec. 3d, 1872 (3 pints), 14 feet below top of 3d S. S., and 48 hours afterward it was producing at the rate of 10 barrels per day.

The well declined very slowly, and on the 26th of June, 1873, it was still producing 4 barrels per day.

*Colorado Well, No. 18.*

January 25th, 1873.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	15 feet.	15	=
Interval, containing 1st and 2d S. S.....	578 to	593	=
3d S. S.....	45 "	638	=
? .....	11 "	649	=

Drilled dry. Cased at 275 feet.

But little salt water and no oil came into the well until the drill had penetrated the 3d S. S. about 14 feet, here both oil and salt water came in, filling up the hole 75 feet or more. The best and softest part of the 3d S. S. was from 21 to 28 feet below the top of the rock.

Natural production less than one-half a barrel per day.

Torpedoed February 26, 1873 (3 pints), 14 feet below top of 3d S. S. Production brought up to 2 barrels of oil and 10 or 12 barrels of salt water per day. Pumped about four weeks at this rate, then commenced to increase in oil and decrease in salt water, and in ten days was pumping 24 barrels of oil per day. Pumped at this rate for ten or twelve days, then gradually declined, and four months after torpedoing, was pumping 9 barrels daily.

*Colorado Well, No. 19.*

February 19th, 1875.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	15 feet.	15	=
Interval, containing 1st and 2d S. S.....	514 to	529	=
3d S. S.....	42 "	571	=
?.....	$9\frac{1}{2}$ "	$580\frac{1}{2}$	=

Drilled dry. Cased at 181 feet.

3d S. S. hard on top but at the depth of 5 feet changed for the better, and some oil and salt water came in. Rock remained quite close until the drill had gone down 13 feet in the sand when it became softer, but still there was no perceptible increase of fluid in the hole. From 13 feet down to 22 feet the sand was rather soft, and remained good down to 33 feet, from which downward it gradually grew finer and harder.

Natural production about  $1\frac{1}{2}$  barrels of oil and 12 to 15 barrels of salt water per day.

Feb. 22, 1876, torpedoed (3 pints) 14 feet below top of 3d S. S. After

torpedoing it commenced to pump at the rate of 15 barrels per day, and increased gradually, and on

March 1st,	it was pumping	30 barrels per day.
“ 20th,	“ “	34 “ “
April 1st,	“ “	28 “ “
“ 8th,	“ “	30 “ “
May 10th,	“ “	20 “ “

*Colorado Well, No. 20.*

April 11th, 1876.

Level of well mouth above ocean.....		
Drive pipe to rock.....	41 feet.	41 =
Interval, containing 1st and 2d S. S.....	455 to 496	=
3d S. S.....	44 “	540 =
?.....pocket.	10 “	550 =

Drilled dry. Cased at 159 feet.

Softest part of 3d S. S. from 5 to 18 feet below the top. Oil began to come in with a very little salt water while drilling between 5 and 8 feet. Quite an increase of salt water at 24 feet. Gradual increase of gas all the way from 5 to 25 feet. Sand very hard at 39 feet, but good at the bottom of the rock.

Natural production 2½ barrels of oil, with about 8 barrels of salt water per day.

April 21st, 1876, torpedoed (3 pints) 8½ feet below top of 3d S. S. Production during the first twenty-four hours thereafter, 7 barrels of oil with not much increase of salt water and a small increase of gas.

May 10th, 1876, pumping 6 barrels of oil per day.

*Colorado Well, No. 21.*

June 7th, 1876.

Level of well mouth above ocean.....		
Wooden conductor to rock.....	10 feet.	10 =
Stove pipe casing*.....	14 “	14 =
Interval, containing 1st and 2d S. S.....	614 “	628 =
3d S. S.....	41 “	669 =
?.....pocket.	10 “	679 =

Drilled dry. Cased at 249 feet.

The softest and best part of the 3d S. S. commenced at 2 feet below its

\* Sometimes the conductor is not properly driven to the rock. The drilling commences, and after going down some distance it is discovered that the loose material is falling in at its bottom. When the “cave” is not very serious a common, riveted, sheet iron “stove pipe” cylinder is shoved down to prevent its enlargement. This casing is merely a supplement or lining to the conductor, and represents what should have been the length of the conductor had it properly been put in originally.

top and continued down to 8 feet. Here oil and gas and salt water came into the hole. The sand was quite soft until the rock had been penetrated 30 feet, after this it was very hard until quite near the bottom, where it was found to be soft and coarse.

Natural production about 5 barrels of oil with 10 barrels of water during the first twenty-four hours. Three days later it was pumping 6 barrels of oil.

June 18th, 1876, pumping about 5½ barrels of oil.

June 20th, 1876, torpedoed (3 pints) 6 feet below top of sand. Result 15 barrels at first, gradually running down to 8½ by Nov. 25th.

*Magnolia, No. 1.*

Struck June, 1872.

Located on Ware Farm, Colorado District.

Level of well mouth above ocean*.....			
?	438	to 438	=
1st S. S.....	30	" 468	=
?	122	" 590	=
2d S. S.....	10	" 600	=
?	82	" 682	=
3d S. S.....	43	" 725	=
?	10	" 735	=

Drilled dry. Cased at 286 feet.

Show of oil at 688, and gas at 696.

3d S. S. rather dark and close.

Production, after one torpedo, about 2 barrels per day.

Pumped at intervals until January, 1873.

*Magnolia, No. 2.*

Struck July 7th, 1873.

Ware Farm, Colorado District.

Level of well mouth above ocean*.....				1615
7½ inch casing to rock.....	61 feet.	61	=	1554
?	691	to 752	=	863
3d S. S.....	42	" 794	=	821
Slate.....	1	" 795	=	820
Very hard shell.....	5	" 800	=	815
?	5	" 805	=	810

Drilled dry. Cased at 350 feet.

Best and softest part of 3d S. S. from near the top down to 12 feet. Good sand all the way down to 30 feet. Oil came in while drilling, but could not tell at what point, on account of the accumulation of salt water in the hole, coming down from the 2d S. S.

Natural production between 3 and 4 barrels per day.

\* Oil City Depot, provisionally 995' + P. R. R. datum.

July 9th, 1873. Torpedoed (3 pints) 7 feet below top of 3 S. S. Produced about 11 barrels the next 24 hours.

July 12th. Torpedoed (3 pints) 12 feet below top of rock. No increase.

*Chick Well, No. 1.*

January, 1872.

Colorado District.

Level of well mouth above ocean .....			
? .....	598	to 598	=
2d S. S. ....	19	" 617	=
? .....	85	" 702	=
3d S. S. ....	34	" 736	=
? .....	25	" 761	=

"Measured by the drillers; probably incorrect."

Cased with 5<sup>3</sup>/<sub>8</sub>" casing, but failed to shut off the water. Afterwards cased with 3<sup>1</sup>/<sub>4</sub>" casing to depth of 450 feet.

3d S. S. about 43 feet thick. Close and dark. Best part of it from 717 to 720 feet. Fair at 734 feet.

Natural production less than one barrel per day.

Torpedoed at 705 feet and 717<sup>1</sup>/<sub>2</sub> feet. Increased to about 3 barrels per day. The well was pumped by heads, and in January, 1873, produced about 2 barrels per day.

*Chick Well, No. 2.*

Nov. 15th, 1873.

Colorado District.

Level of well mouth above ocean.....			
? .....	0	to 734	=
3d S. S. ....	45	" 779	=

Drilled dry. Cased at ———

Mud vein 5 feet below top of 3d S. S. Sand soft at top. Very good between 12 feet and 20 feet. Salt water at 24 feet.

The well filled up with oil about 200 feet before the salt water vein was struck.

Natural production about 10 barrels per day.

Dec. 3d, 1873, torpedoed 13 feet below top of 3d S. S. Production increased to 60 barrels per day. Declined gradually to 15 barrels by Feb. 15th, 1874.

Torpedoed a second time, resulting in a slight increase of oil for a short time.

*Chick Well, No. 3.*

February 13th, 1873.

Colorado District.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	20 feet.	20	
? .....	736	to 756	=
3d S. S. ....	52	" 808	=
? .....	14	" 832	=



Drilled dry. Cased at 378 feet.

Strong flow of gas and oil when 3d S. S. was first struck, and the well filled up nearly 300 feet with oil.

Mud vein about 5 feet below top of 3d S. S. Sandrock rather ordinary for the first 25 feet, below that point quite hard, and at the bottom gray and dark. Softer than usual at 17 feet below the top. Salt water appeared between 25 and 30 feet below the top of sand.

Natural production, 75 barrels of oil and 100 barrels of salt water per day.

June 25th, 1873, the production was 25 barrels per day.

*Potter Well, No. 1.*

February 3d, 1873.

Colorado District.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	25 feet.	25	
? .....	645½ to	670½ =	
3d S. S. ....	47 "	717½ =	
? .....	12½ " pocket.	730 =	

Drilled dry. Cased at 266 feet.

3d S. S. good from top to bottom. Soft at 6 feet. Also from 12 to 15 feet, and extra quality at 42 feet. The lower part of the sand was softer than the upper, which is not generally the case in this locality.

The well filled up with fluid nearly 300 feet while drilling, but it was mostly composed of salt water.

Natural production, about 3 barrels of oil and 12 barrels of salt water per day.

Feb. 5th. Torpedoed 12 feet below top of 3d S. S. Bottom of hole filled up one foot with sand. Result, 12 barrels of oil and 50 barrels of salt water per day at first, declining to 6 barrels of oil in four days.

Feb. 10th. Torpedoed 6 feet below top of sand. Well filled up with sand 4 feet. Production slightly increased for a short time.

March 12th. Treated the well with 10 volcanic burners. But slight improvement.

April 2d. Torpedoed 21 feet below top of sand. No benefit.

April 21st, 1873. Abandoned the well.

*Potter Well, No. 2.*

February 11th, 1873.

Colorado District.

Well mouth above ocean.*.....			1550
Wooden conductor.....	15 feet.	15 =	1535
? .....	663 to	678 =	872
3d S. S. ....	50 "	728 =	822
? .....	16 " pocket.	744 =	806

Drilled dry. Cased at 264 feet.

\* Oil City Depot provisionally 995' + P. R. R. datum.

The 3d S. S. was good all the way through. Uncommonly so, for the first 20 feet, at which depth there was a good show of oil and gas. Below 25 feet the sand was somewhat harder and finer.

Natural production less than one barrel of oil and 8 or 9 barrels of salt water per day.

Feb. 13th. Torpedoed 20 feet below top of 3d S. S. The well filled up with sand 5 feet. Results, good. An increase both in oil and salt water. After several days' delay in getting the well to work, it pumped when first started up 16 barrels of oil and 100 barrels of salt water per day.

March 18th. Treated it with 10 volcanics. Results, an increase of gas and slight increase of oil.

June 20th, 1873, it was pumping 9 barrels of oil and 18 barrels of salt water.

*Potter Well, No. 3.*

March 21st, 1873.

Colorado District.

Well mouth above ocean*.....				1549
Wooden conductor to rock .....	16 feet.	16	=	1533
?.....	661 to 677	=		872
3d S. S.....	50 "	727	=	822
?.....	8 " 735	=		814

Drilled dry. Cased at 270 feet.

The 3d S. S. was good throughout its entire thickness, soft for the first 24 feet, then somewhat harder, but not very hard in any part.

Natural production 2 barrels of oil and 6 or 8 barrels of salt water per day.

April 9th. Torpedoed (3 pint shell), production increased to 15 barrels of oil per day. Sustained the yield at this point for some time and then slowly declined to 8 barrels by the 20th of June following.

*Potter Well No. 4.*

March 21st, 1873.

Colorado District.

Level of well mouth above ocean.....				
Wooden conductor to rock.....	19 feet.	19		
?.....	637 to 656	=		
3d S. S.....	47 "	703	=	
?.....	10½ " 713½	=		

Drilled dry. Cased at 255 feet.

3d S. S. very uneven. Upper 13 feet soft, next 3 feet very hard, then 3 or 4 feet of soft sand. Below this finer and more even in composition.

Natural production 1 barrel of oil and 15 or 20 barrels of salt water per day.

March 26th. Torpedoed (3 pint shell) 16 feet below top of 3d S. S. Results, an increase to 4 or 5 barrels of oil and 100 barrels of salt water per

\* Oil City Depot provisionally 95' + P. R. R. datum.

day. Pumped in this way for some time and then gradually increased in oil until it produced 8 barrels per day. A decline then commenced both in oil and salt water. On June 24th, 1873, it had settled back to 5 barrels of oil per day, and on August 6th, to 3 barrels per day. At this time it was torpedoed again, and the next day was pumping at the rate of 8 barrels of oil per day.

On the 21st of August it had run down to 4 barrels per day, with a slight increase in the volume of gas. From this time it gradually declined to 1 barrel per day where it remained for two or three months.

Jan. 22, 1874. Flooded sandrock with benzine with no improvement either to oil or gas.

Jan 28th. Put in one of Quick & Fertig's Injectors.\* After the first two injections the production rose to 2½ barrels, increasing to 5 barrels by the end of one week from the time the injector was put in. Benzine was used in the injector; and a gradual increase in production occurred until on July 24th, 1874, the well was pumping 17 barrels of oil per day.

*Potter Well, No. 5.*

April 4th, 1873.

Colorado District.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	16 feet.	16	=
?.....	655 to	671	=
3d S. S.....	46 "	717	=
?.....pocket.	11 "	728	=

Drilled dry. Cased at .

3d S. S. good. Upper 35 feet white and soft, then 5 feet of gray and the remaining 6 feet white but hard.

Natural production 2 barrels of oil and 8 to 10 barrels of salt water per day.

April 8th. Torpedoed and brought the production up to 140 barrels of oil per day, but it rapidly declined to 16 barrels, and on June 24th had still further declined to 12 barrels per day. It never pumped much salt water.

*Potter Well, No. 6.*

June 4th, 1873.

Colorado District.

Level of well mouth above ocean.....			
Wooden conductor to rock.....	18 feet.	18	=

\* The "injector" is a patented device by which perforations made in the tubing just above the pump chamber can be opened and closed at pleasure by the "sucker rods." Benzine is poured in at the top of the well and the pump kept in motion until the oil in the well and tubing is pumped out and benzine begins to show at the delivery pipe. The tubing is now full of benzine and the well is empty, or nearly so. On opening the apparatus in the injector, the 500 or 1000 feet of benzine in the tubing forces out strong jets in all directions against the walls of the well washing them down with force and giving more satisfactory results than can be obtained by a simple "flooding" with benzine. The process may be repeated again and again until the desired effect is produced.

?	639 to 657	=
3d S. S.	46 " 703	=
?.....pocket.	12 " 715	=

Drilled dry. Cased at 240 feet.

3d S. S. good to the depth of 32 feet, below that, finer and not so white.

Oil came in near top of the sand and salt water 4 feet below the top.

Natural production 2 barrels of oil with 6 or 8 barrels of salt water per day.

June 6th. Torpedoed and increased the production to 150 barrels of oil daily. Declined in fourteen days to 36 barrels daily.

June 28th, 1875. Torpedoed 6 feet below top of 3d S. S. Result  $3\frac{1}{2}$  barrels per day.

*Potter Well, No. 7.*

July 11th, 1873.

Colorado District.

Level of well mouth above ocean.....		
Wooden conductor to rock.....	16 feet. 16	=
?	629 to 645	=
3d S. S.	46 " 691	=
?.....pocket.	13 " 704	=

Drilled dry. Cased at 229 feet.

3d S. S. very soft the first 12 feet, soft the next 14 feet and then harder and not so good as the drill approached the bottom. The well filled up with oil very fast after the sand was struck and while the first "bit" was being run in it.

Natural production 8 barrels per day.

July 14. Torpedoed (3 pint shell)  $6\frac{1}{2}$  feet below top of 3d S. S. Result, a production of 100 barrels of oil per day.

Nov. 20th, 1874. Production down to  $\frac{2}{3}$  of a barrel per day. Torpedoed (giant powder)  $7\frac{1}{2}$  feet below top of sand. No increase in gas and very little in oil.

From July, 1876, until the 11th of October following, this well produced 2 barrels per day, and then, without any treatment whatever, began to increase. On Oct. 25th it was producing  $5\frac{1}{3}$  barrels, Nov. 10th,  $6\frac{2}{3}$  barrels, and Nov. 25th,  $5\frac{1}{2}$  barrels.

*Potter Well, No. 8.*

April 27th, 1876.

Colorado District.

Level of well mouth above ocean.....		
Wooden conductor to rock.....	15 feet. 15	=
?	616 to 631	=
3d S. S.	47 " 678	=
?.....pocket.	10 " 688	=

Drilled dry. Cased at 225 feet.

3d S. S. first 4 feet very hard, next 8 feet very soft; then 9 feet a little firmer but not hard; then 10 feet softer; the remaining 16 feet being about an average sand. The first show of oil was at 21 feet below the top of the sand. Very little salt water and gas came into the hole while drilling, and when the well was tubed there was not more than 20 feet of fluid in it.

Natural production less than  $\frac{1}{4}$  of a barrel of oil with about 5 barrels of salt water per day.

The first torpedo exploded 18 feet below top of sand increased the salt water slightly but not the oil and gas.

May 8th. Second torpedo (3 pint shell) 6 feet below top of sand. No improvement.

May 11th. Employed the scratcher. No improvement.

May 12th. Torpedoed 30 feet below top of sand. No increase either in oil or gas.

June 6th. Put in Quick & Fertig's injector. Still no improvement.

The well was abandoned June 22d, 1876, after having been pumped steadily for nearly two months.

*Darling Well.*

Drilled in 1865.

Gilson Run, Warren County.

Level of well mouth above ocean.....	.....	
Drive pipe.....	57½ feet.	
Soft slate.....	at 70 "	
Very hard slate and 3 inch crevice.....	" 78 "	
20 inch of salt water.....	" 145 "	
Soft slate, 15 inch crevice.....	" 175 "	
Very fine sandrock.....	" 185 "	
12 inch crevice.....	" 230 "	
Some oil, 15 inch crevice.....	" 290 "	
Bottom of sandrock.....	" 310 "	
Grey sandrock.....	" 355 "	
Water course carrying away everything from the well.....	" 373 "	
Some oil, 15 inch crevice.....	" 399 "	
Fine white sand.....	" 411 "	
Bottom of Sand.....	" 426 "	
Flint and slate.....	" 450 "	
Top of sandrock.....	" 514 "	
Coarse white pebble sand, 6 inch crevice.....	" 522 "	
Pebble rock and bottom of well.....	" 541 "	

This well was never cased. The water was shut off by seed bag on tubing. It was pumped some time, producing several barrels of oil which is supposed to have come from the 2d S. S.

*Clifton Well, No. 1*

April, 1872.

Colorado District, southeast corner of tract 200.

Level of well mouth above ocean .....			
? .....	0	to	402 =
1st S. S., (estimated).....	20	"	422 =
? .....	123	"	545 =
2d S. S.....	19	"	564 =
? .....	84	"	648 =
3d S. S.....	42	"	690 =

Drilled dry. Cased at 264 feet.

Very poor sand. Well never tubed.

*Eclipse Wells.*

Colorado District.

Level of well mouth above ocean.....			
6¼ inch casing to rock.....	48 feet.	48	=
Mountain sand.....	162	to	210 =
? .....	240	"	450 =
1st S. S. (estimated).....	20	"	470 =
? .....	55	"	525 =
2d S. S. (estimated).....	10	"	535 =
? .....	45	"	580 =
3d S. S. (estimated).....	20	"	600 =
? .....	76	"	676 =
4th S. S.....	29	"	705 =
? .....	12	"	717 =

*Cadwell Well.*

Hill Farm, Colorado District.

Level of well mouth above ocean.....			
6¼ inch casing to rock.....	36	to	36 =
? .....	280	"	266 =
1st S. S.....	29	"	295 =
? .....	105	"	400 =
2d S. S.....	18	"	418 =
? .....	83	"	501 =
3d S. S.....	46	"	547 =
? .....	4	"	551 =

Wet hole. Cased (3¼ inch) at 275 feet.

Abandoned Dec. 30th, 1875.

*Onondaga Well.*

East of Enterprise; Colorado District.

Level of well mouth above ocean.....			
Drive pipe.....	62 feet.	62	=

?	137 to 199	=
S. S. gray	25 (?) "	224 =
?	236 "	455 =
2d S. S.	15 "	470 =
?	51 "	521 =
3d S. S.	13 "	534 =
?	36 "	570 =
4th S. S.	15 "	585 =
?	90 "	675 =
5th S. S.	26 "	701 =
Soft measures. No sandstone.	99 "	800 =

*Enterprise, Warren County.*

Benedict Estate Wells, copied from office records.

*Benedict Estate Well, No. 1.*

Level of well mouth above ocean		
?	192 to 192	=
1st S. S.	50 "	242 =
?	58 "	300 =
2d S. S.	4 "	304 =
?	31 "	335 =
3d S. S.	10 "	345 =
?	117 "	462 =
4th S. S.	15 "	477 =

*Willard Well, No. 1.*

Level of well mouth above ocean		
Upper measures not noted	443 to 443	=
3d S. S.	25 "	468 =

*Harvey Well, No. 1.*

Level of well mouth above ocean		
?	180 feet. 180	=
1st S. S.	49 to 229	=
?	71 "	300 =
2d S. S.	6 "	306 =
?	16 "	322 =
3d S. S.	12 "	334 =
?	95 "	429 =
4th S. S.	6 "	435 =
?	14 "	449 =
5th S. S., oil.	15 "	464 =

*McKinney Well, No. 1.*

Level of well mouth above ocean		
Upper measures not noted	441 to 441	=
3d S. S.	21 "	462 =

*Reed Well.*

Adjoining Benedict Estate. Record from memory of driller.

Level of well mouth above ocean.....			
?	150 feet.	150	=
1st S. S.....	52 to	202	=
Slate, blue.....	118 "	320	=
2d S. S.....	14 "	334	=
S. S., hard, gray.....	12 "	346	=
Slate, black.....	99 "	445	=
Stray S. S., gray.....	12 "	457	=
Slate.....	12 "	469	=
3d S. S..... [doubtful whether 12 or 22]	22 "	491?	=

*Tidioute and Warren Oil Co.*

Dennis Run between Triumph and Tidioute.

Records furnished by Major Cushing, of Tidioute.

*Lease No. 58. Well No. 1.*

Well mouth above ocean*.....		(?)	1230
?	45 to 45	=	1185
1st S. S.....	30 (?) "	75?	= 1155
?	62 "	137	= 1093
2d S. S.....	25 (?) "	162?	= 1068
?	133 - "	295	= 935
Stray S. S.....	47 "	342	= 888
?	8 "	350	= 880
?			.....pocket.
Depth of well.....			

*Well No. 2.*

Level of well mouth above ocean.....			
?	124 to 124	=	
1st S. S.....	29 "	153	=
?	63 "	216	=
2d S. S.....	28 "	244	=
?	26 "	270	=
Stray S. S.....	16 "	286	=
?	90 "	376	=
3d S. S.....	48 "	424	=

*Well No. 3.*

Level of well mouth above ocean.....			
?	180 to 180	=	
1st S. S.....	30 "	210	=
?	60 "	270	=
2d S. S.....	35 "	305	=
?	35 "	340	=

\* Oil City Depot provisionally 995' + P. R. R. Datum.



Stray S. S.....	25	to	365	=
? .....	60	"	425	=
3d S. S.....	50	"	475	=

At 436 first show of oil ; at 445 second show of oil.

*Well No. 4.*

Level of well mouth above ocean.....				
? .....	320	to	320	=
1st S. S.....	35	"	355	=
? .....	55	"	410	=
2d S. S.....	35	"	445	=
? .....	27	"	472	=
Stray S. S.....	13	"	485	=
? .....	82	"	567	=
3d S. S.....	27	"	594	=

*Well No. 5.*

Level of well mouth above ocean.....				
? .....	332	to	332	=
1st S. S.....	47	"	379	=
? .....	44	"	423	=
2d S. S.....	35	"	458	=
? .....	29	"	487	=
Stray S. S.....	13	"	500	=
? .....	84	"	584	=
3d S. S.....	48	"	632	=

*Triumph Oil Co.*

Triumph, Warren Co. From books in office of Company.

*Well No. 23.*

Level of well mouth above ocean.....					
? .....	660	to	660	=	
3d S. S. {	Fine hard sand.....	30	"	690	=
	Medium     " .....	13	"	703	=
	Good       " .....	17	"	720	=
	79 feet. { Pebble, (crevice at 722½).....	10	"	730	=
	Good sand.....	9	"	739	=

*Well No. 101.*

Level of well mouth above ocean.....				
? .....	662	to	662	=
3d S. S.....	88	"	750	=
? .....	6	"	756	=

Sand very good.

*Well No. 146.*

Level of well mouth above ocean.....			
? .....	694	to	694 =
3d S. S.....	96	"	790 =

Coarsest from 764 to 774.

Salt Water at 773.

*Well No. 148.*

Level of well mouth above ocean.....			
? .....	712	to	712 =
3d S. S.....	103	"	815 =

Coarsest sand at 795 feet.

Mud at 732, 765 and 785.

*Well No. 149.*

On highest point of hill.

Level of well mouth above ocean.....			
? .....	729	to	729 =
3d S. S.	{	Pebble.....	2 " 731 =
		Coarse sand.....	1 " 732 =
74 feet.	{	Medium " .....	2 " 734 =
		Pebble.....	20 " 754 =
	{	Coarse sand.....	10 " 764 =
		Pebble.....	20 " 784 =
	{	Coarse sand.....	12 " 796 =
		Pebble.....	4 " 800 =
Medium sand.....		3	" 803 =
? .....		6	" 809 =

*Well No. 152. B.*

Level of well mouth above ocean.....			
? .....	712	to	712 =
3d S. S.....	90	"	802 =
? .....		3	" 805 =

Upper 60 feet fine.

Lower 30 feet coarse.

*Well No. 224.*

Level of well mouth above ocean.....			
? .....	675	to	675 =
3d S. S.....	107	"	782 =
? .....		3	" 785 =

Good sand at 759.

Pebble at 782.

*Well No. 237.*

Level of well mouth above ocean.....				
?	.....	667	to	667 =
3d S. S.	{ Fine sand..... Very coarse pebble.....	56	"	723 =
		20	"	743 =
106 feet.	{ Fine sand..... Grayish pebble.....	10	"	753 =
		20	"	773 =
?	..... pocket.	3	"	776 =
Mud at 701 and 710.				
Salt water at 747.				

*Rising Sun Well.*

Dennis Run. From S. Minor.

Level of well mouth above ocean.....				
?	.....	104	to	104 =
1st S. S.	.....	30	"	134 =
?	.....	61	"	195 =
2d S. S.	.....	28	"	223 =
?	.....	117	"	340 =
3d S. S.	.....	28	"	368 =

There was a gray rock about 20 feet below the 2d S. S., and sometimes 25 feet thick. All the rocks were very hard.

*Dennis Run.*

Wells of J. & E. W. Parshall on tract of N. Y. and Allegheny Oil Co., Dennis Run, near Tidioute. Furnished by Mr. Parshall.

*Well No. 4.*

Level of well mouth above ocean.....				
?	.....	320	to	320 =
1st S. S., estimated.	.....	30	"	350 =
?	..... (including 2 S. S.)	230	"	580 =
3d S. S.	.....	36	"	616 =
?	..... pocket.	5	"	621 =

*Well No. 5.*

Level of well mouth above ocean.....				
?	.....	330	to	330 =
1st S. S., estimated.	.....	30	"	360 =
?	..... including 2d S. S.	230	"	590 =
3d S. S.	.....	40	"	630 =

*Well No. 7.*

Level of well mouth above ocean.....				
?	.....	240	to	240 =
1st S. S., estimated.	.....	30	"	270 =
?	..... including 2d S. S.	222	"	492 =

3d S. S. ....	50	to	542	=
? .....pocket.	5	"	547	=

*Well No. 9.*

Level of well mouth above ocean .....				
? .....including 1st S. S.	301	to	301	=
2d S. S., estimated.....	25	"	326	=
? .....	115	"	441	=
3d S. S. ....	66	"	507	=
? .....pocket.	6	"	513	=

*Well No. 10.*

Level of well mouth above ocean.....				
? .....	224	to	224	=
1st S. S., estimated.....	30	"	254	=
? .....including 2d S. S.	208	"	462	=
3d S. S. ....	69	"	531	=
? .....pocket.	23	"	554	=

*Well No. 12.*

Level of well mouth above ocean.....				
? .....	255	to	255	=
1st S. S., estimated.....	30	"	285	=
? .....including 2d S. S.	233	"	518	=
3d S. S. ....	82	"	600	=
? .....pocket.	20	"	620	=

## Dennis Run Tract. E. W. Parshall's Wells.

*Well No. 1.*

Level of well mouth above ocean.....				
? .....	110	to	110	=
Mountain S. S. ....	37	"	147	=
? .....	151	"	298	=
1st S. S. ....	43	"	341	=
? .....	89	"	430	=
2d S. S. ....	30	"	460	=
? .....	91	"	551	=
3d S. S. ....	36	"	587	=
? .....	15	"	602	=

*Well No. 2.*

Level of well mouth above ocean.....				
? .....	73	to	73	=
Mountain S. S., estimated.....	35	"	108	=
? .....	153	"	261	=

1st S. S., estimated.....	40	to	301	=
? .....	88	"	389	=
2d S. S., estimated.....	30	"	419	=
? .....	95	"	514	=
3d S. S.....	50	"	564	=

*Well No. 3.*

Level of well mouth above ocean.....				
? .....	274	to	274	=
1st S. S.....	32	"	306	=
? .....	221	"	527	=
3d S. S.....	50	"	577	=

Richardson, Tidioute. East side of Allegheny River. From Messrs. Rallston & Harrington.

*Well No. 1.*

Situated half way down the hill.

Level of well mouth above ocean.....				
? .....	84	to	84	=
1st S. S.....	24	"	108	=
? .....	29	"	137	=
2d S. S.....	23	"	160	=
? .....	76	"	236	=
3d S. S.....	9	"	245	=

*Well No. 2.*

Up the hill.

Level of well mouth above ocean.....				
? .....	310	to	310	=
1st S. S.....	20	"	330	=
? .....	24	"	354	=
2d S. S.....	24	"	378	=
? .....	71	"	449	=
3d S. S.....	11	"	460	=

## NOTES.

In drilling an oil well, the measures passed through are necessarily divided into three groups or divisions. Each one of these divisions requires a specific treatment at the hands of the driller.

The first division is composed of Drift or the loose surface accumulations from the surrounding rocks; the second embraces the immediately underlying series of stratified rocks to the depth at which they contain water; and the third, the remainder of the well, including the oil sands at the bottom. The walls of the third division are generally self-supporting, remaining just as the drill leaves them, and this division, when the well is completed, is the only one where the rocky walls are bare.

The first division, owing to the loose and crumbling material of which it is composed, requires some mechanical device to prevent it from slipping or caving into the hole as it is drilled. Here the "conductor" is used. A "conductor" may be simply a long box, without ends, made by spiking together four planks 2" thick by 10" wide—a "wooden conductor;" or it may be "drive pipe," composed of a number of cast-iron cylinders joined together and driven through the deposit; or it may be what is now more generally used, wrought-iron "surface casing," put in in a somewhat similar manner.

The "wooden conductor" can only be economically used where the surface deposit is of inconsiderable depth, as a pit must be sunk to the rock before it can be put in place. After the rock has been laid bare by the pick and shovel, the "conductor" is securely set between it and the derrick floor, the drill is let down to the rock through the conductor and the work of boring commences.

Where it is suspected that the floor of the Drift lies too deep to be reached by digging, cast-iron "drive pipe" is used. This pipe is cast in sections about 9' long. A space of 4" at each end is carefully turned in a lathe to a certain gauge, and the end is cut smoothly at right angles to the axis of the pipe, so that the joints will stand perpendicularly one upon the other. A joint of pipe is placed on end in the centre of the derrick between two "guides" which have been temporarily erected for the purpose of driving it. A heavy "mall" working between these guides is raised and dropped upon the pipe, slowly forcing it into the ground, precisely as piles are driven for docks, bridges, &c. When the top of a joint has been driven to the level of the derrick floor, a band of wrought-iron, made to fit the turned ends of the pipes and heated red-hot, is quickly slipped upon the end of the driven pipe and another joint at once set up. The contraction of this band in cooling holds the two joints firmly together and the driving process then goes on. In this way joint after joint is added and driven until solid rock is reached. As many as 23 joints have been used in a well. Great care is required when so long a "string of pipe" is driven to keep it straight and perpendicular, a broken band, or a large boulder encountered may cause the pipe to so far deviate from the perpendicular as to necessitate the abandonment of the well. To avoid this the pipe should be frequently cleaned out by the drill while being driven.

The more common method now employed in driving the well shafts through these thick accumulations of loose materials, is to use heavy wrought-iron casing, made expressly for the purpose and armed with a hardened collar or "shoe," at the bottom. This casing is made in joints about 20' in length, which screw together in wrought-iron "thimbles," the same as do ordinary gas pipes. The tube being thin and light as compared with cast-iron drive pipe, cannot be so forcibly driven, but is worked down carefully by drilling a hole the full size of its inside diameter, and always keeping this hole open some feet in advance of the bottom of the pipe. In

*(Continued on page 378.)*

*Columbia Farm (Old Story Farm,) on Oil Creek, one mile below Petroleum*

NAME OF WELL.	Depth of Conductor.	Rock Inter-val.	FIRST SAND.			Rock Inter-val.	SECOND SAND.		
			Top.		Bottom.		Top.		Bottom.
Babcock ..	36	304	340	50	390	52	442	25	467
Stewart...	18	276	294	39	333	103	436	26	462
Reiter ....	18	399	417	47	464	74	538	25	563
Jones. ....	27	292	319	37	356	105	461	24	485
Blocher ..	30	207	237	28	265	105	370	23	393
No. 58..	27	313	340	33	373	72	445	36	481
" 59..	18	282	300	19	319	124	443	21	464
" 61..	21	458	479	21	500	101	601	23	624
" 62..	27	270	497	32	529	73	602	34	636
" 64..	27	498	525	30	555	82	637	33	670
" 66..	18	518	536	31	567	101	668	23	691
" 69..	24	528	552	27	579	85	664	31	695
" 70..	24	146	170	29	199	111	310	27	337
" 71..	27	502	529	44	573	107	680	20	700
" 72..	18	272	290	35	325	105	430	40	470
" 73..	18	262	280	35	315	102	417	18	435
" 74..	18	257	275	30	305	105	410	27	437
" 77..	36	483	519	42	561	97	658	22	680
" 78..	18	487	505	25	530	123	653	22	675
" 80..	27	525	552	35	587	107	694	24	718
" 81..	18	322	340	45	385	100	485	30	515
" 82..	18	312	330	40	370	115	485	25	510
" 85..	27	258	285	55	340	95	435	20	455
" 86..	36	304	340	50	390	85	475	25	500
" 87..	45	315	360	32	392	98	490	24	514
" 89..	18	262	280	30	310	135	445	24	469
" 90..	18	287	305	50	355	105	460	20	480
" 91..	18	269	287	57	344	115	459	22	481
" 94..	54	171	225	20	245	120	365	33	398
" 96..	18	382	400	40	440	85	525	39	564
" 97..	45	290	335	50	385	103	488	20	508
" 99..	27	508	535	45	580	105	685	20	705
" 100..	27	375	402	53	455	84	539	15	554
" 101..	26	354	380	50	430	101	531	24	555
" 103..	27	283	310	40	350	90	440	41	481
" 104..	27	438	465	50	515	92	607	24	631
" 105..	18	339	357	53	410	90	500	27	527
" 106..	27	482	509	50	559	100	659	25	684
" 107..	27	281	308	40	348	102	450	26	476
" 108..	18	527	545	31	576	103	679	72	751
" 109..	9	521	530	40	570	110	680	30	710

Centre, Venango Co. Pa. From the books of the Columbia Oil Company.

Rock Inter- val.	STRAY SAND.			Rock Inter- val.	THIRD SAND.			Pocket.	Feet Depth.
	Top.		Bottom.		Top.		Bottom.		
76	543	30	573	20	593	50	643	10	653
58	520	30	550	21	571	53	624	3	627
49	612	30	642	20	662	54	716	6	722
68	553	30	583	20	603	51	654	3	657
76	469	31	500	10	510	52	562	8	570
39	520	32	552	20	572	43	615	3	618
46	510	30	540	19	559	53	612	6	618
53	677	33	710	21	731	49	780	15	795
44	680	30	710	19	729	41	770	11	781
53	723	30	753	17	770	40	810	0	810
63	754	32	786	18	804	46	850	0	850
52	747	34	718	12	793	39	832	5	837
60	397	33	430	17	447	45	492	3	495
54	754	30	784	21	805	40	845	5	850
37	507	25	532	30	562	42	604	0	604
74	509	33	542	14	556	50	606	0	606
69	506	30	536	15	551	37	588	7	595
78	758	28	786	12	798	45	843	0	843
54	729	31	760	15	775	40	815	6	821
67	785	27	812	18	830	36	866	2	868
53	568	31	599	19	618	34	652	3	655
40	550	33	583	17	600	38	638	3	641
45	500	33	533	22	555	40	595	3	598
51	551	29	580	20	600	45	645	3	648
54	568	30	598	21	618	50	668	3	671
46	515	31	546	20	566	39	605	5	610
53	533	26	559	15	574	38	612	3	615
64	545	29	574	12	586	37	623	4	627
49	447	33	480	20	500	40	540	5	545
52	616	27	643	12	655	33	688	2	690
50	558	30	588	22	610	50	660	5	665
52	757	28	785	24	809	41	850	3	853
73	627	30	657	18	675	50	725	2	727
63	618	33	651	17	668	30	698	3	701
71	552	21	573	17	590	50	640	2	642
60	691	26	717	19	736	50	786	5	791
45	572	30	602	35	637	40	677	1	678
53	737	30	767	17	784	50	834	5	839
64	540	29	569	16	585	54	639	3	642
33	784	27	811	13	824	44	868	2	870
65	775	27	802	13	815	39	854	1	855



NAME OF WELL.	Depth of Conductor.	Rock Inter-val.	FIRST SAND.			Rock Inter-val.	SECOND SAND.		
			Top.		Bottom.		Top.		Bottom.
No. 110..	36	464	500	37	537	143	680	20	700
" 111..	18	350	368	47	415	92	507	55	562
" 112..	27	313	340	35	375	80	455	35	490
" 113..	18	417	435	50	485	97	582	18	600
" 114..	27	405	432	72	504	72	576	24	600
" 115..	27	308	335	37	372	100	472	25	497
" 116..	27	445	472	38	510	108	618	21	639
" 117..	9	206	215	40	255	94	349	20	369
" 118..	18	517	535	32	567	99	666	25	691
" 119..	18	304	322	18	340	125	465	20	485
" 120..	18	492	510	30	540	102	642	23	665
" 121..	30	143	173	29	202	111	313	27	340
" 122..	36	134	170	40	210	90	300	35	335
" 123..	14	346	360	45	405	110	515	25	540
" 124..	16	294	310	30	340	135	475	25	500
" 125..	30	304	334	38	372	97	469	23	492
" 126..	15	441	456	20	476	124	600	24	624
" 127..	18	410	428	20	448	102	550	24	574
" 128..	18	312	330	56	386	100	486	25	511
" 129..	27	235	262	35	297	102	399	28	427
" 130..	20	286	306	41	347	100	447	28	475
" 131..	18	507	525	40	565	100	665	24	689
" 132..	16	217	233	30	263	110	373	24	397
" 133..	26	169	195	45	240	105	345	20	365
" 134..	13	470	483	39	522	98	620	35	655
" 135..	28	469	497	30	527	102	629	29	658
" 136..	13	417	430	71	501	72	573	23	596
" 137..	11	349	360	40	400	100	500	26	526
" 138..	14	366	380	45	425	95	520	22	542
" 139..	36	306	342	39	381	99	480	28	508

(Continued from page 375.)

the old filled up valley of the Tunanquant, at Tarport, McKean Co. Pa. from 200' to 300' of this casing is required in each well.

Wells are spoken of indiscriminately as "small holes" or "wet holes" on the one hand, and as "cased holes" or "dry holes" on the other. A "small hole" must necessarily be a "wet" one, for there is no room to case off the water while drilling; and a "cased hole" must necessarily be a "dry" one, if the casing accomplishes the purpose for which it is used.

If now a well is to be drilled "wet," that is if no effort is to be made to shut off the water which comes into it from the second division mentioned above, to keep it from following the drill down to the oil rocks, then

Rock Inter- val.	STRAY SAND.			Rock Inter- val.	THIRD SAND.			Pocket.	Feet Depth.
	Top.		Bottom.		Top.		Bottom.		
50	750	30	780	20	800	35	835	2	837
18	580	33	613	19	632	52	684	5	689
53	543	29	572	10	582	43	625	3	628
55	655	32	687	18	705	35	740	3	743
62	662	30	692	18	710	48	758	2	760
60	557	29	586	19	605	52	657	7	664
91	730	31	761	*	750	41	791	2	793
64	433	33	466	18	484	52	536	5	541
62	753	33	786	17	803	45	848	5	853
53	538	30	568	12	580	55	635	5	640
66	731	27	758	20	778	47	825	5	830
61	401	33	434	22	456	45	501	2	503
58	393	31	424	18	442	43	485	2	487
61	601	29	630	20	650	45	695	5	700
85	585	26	611	14	625	38	663	0	663
72	564	22	586	20	606	47	653	2	655
44	668	29	697	18	715	53	768	3	771
53	627	31	658	20	678	54	732	2	734
47	558	27	585	18	603	37	640	5	645
73	500	26	526	12	538	45	583	5	588
77	552	24	576	14	590	40	630	2	632
63	752	28	780	20	800	41	841	3	844
61	458	32	490	17	507	35	542	30	572
64	429	33	462	17	479	38	517	20	537
45	700	35	735	25	760	50	810	5	815
62	720	32	752	15	767	40	807	8	815
64	660	28	688	17	705	45	750	10	760
80	606	26	632	*	630	55	685	5	690
81	623	30	653	*	650	52	702	5	707
43	551	29	580	34	614	44	658	5	663

this "conductor" of which we have been speaking, whether of wood, cast-iron or casing, needs only to be 6" in diameter, inside measurement. But if the well is to be drilled "dry," an 8" conductor must be used, as will be seen further on.

In the first case (for a wet well), after the conductor is in place, a plain 5½" hole is drilled all the way to the oil rocks; the water, meantime, nearly filling the well, or perhaps overflowing at the top of the conductor.

In the latter case (for a dry hole), an 8" hole is to be drilled from the bottom of the conductor to a point below the water veins. When this is

\* These are evidently errors in Nos. 116, 137 and 138 as the bottom of the Stray S. S. as here given overlaps upon the 3d S. S.

done, a  $5\frac{1}{8}$ " casing (inside diameter) is inserted, with a device on the bottom so arranged that it will form a water tight joint between the casing and wall of the well. A  $5\frac{1}{2}$ ' hole is then continued down to the oil rocks from the inside of this last "string of casing." If the casing has been inserted to the proper depth and no water is encountered below it, the sand-pump will soon exhaust the water in the process of drilling, and the well be perfectly dry. But if lower veins of water are struck, the casing must be drawn, the hole reamed out to a greater depth, and the casing continued down below them. After the water is exhausted, a few pails full are poured in as circumstances demand; to moisten the drillings and furnish fluid for the sand-pump.

Comparing now the two wells when completed and ready for the pump, we find them both to be of the same size,  $5\frac{1}{2}$ " in diameter. One has simply a conductor through the upper division, all the stratified rocks being bare, is full of water, and has probably shown but very little indication of oil. The other has a conductor through the upper division, casing inside of this to the bottom of the middle division, and is dry—or at least was dry until the striking of the oil sand, when it immediately filled up several hundred feet with oil, or perhaps flowed.

The "dry" well is ready at once for the introduction of the pump tube; the "wet" one must be cased before it is tubed. The casing used for this purpose ("small casing,") is of  $3\frac{1}{4}$ " inside diameter. A "water packer" or "seed bag" is attached to its lower end, which effectually closes the annular space between the outside of the casing and wall of the well. This "small casing," of course, must extend down to the bottom of the second division, the same as the large casing does in the "dry" well, for it has precisely the same duty to perform, the shutting off of the water in the upper rocks from the well shaft.

The well is now tubed with the ordinary 2" "tubing," having a "working barrel" or pump chamber at the bottom, which is placed at or near the point where the oil enters.

Inside of the "tubing" are inserted the "sucker rods" which are connected in the derrick to the "walking beam," and operate the pump valves below.

Upon starting the pump, the "water packer" prevents any of the fluid outside of the casing from entering the well, and the water inside of the casing and in the uncased portion of the well is soon pumped out and the well is said to be "exhausted." As the well exhausts, the oil, which has been held back in the rock by the pressure of the heavy column of water above it, gradually forces its way into the well and is raised by the pump to the surface, unless it has a sufficient force of gas to flow of its own accord afterwards.